Planning for Sustainable Urban Development Using Alternative Energy Solutions

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ABSTRACT

The concept of sustainable development has recently generated significant attention within urban governments. What is sustainable development? What aspects of "sustainable development" agendas have implications for urban areas and for planning? Can energy conservation and energy efficiency be tools to implement sustainable activities in urban areas? By what means might they be achieved? There is an active debate concerning the role of sustainable development as an overarching guide to urban planning. What examples are there of urban areas that are using sustainable development concepts to reduce energy usage?

This article considers the definitions of urban sustainability, explains the origins of sustainable development, and explores the view that urban sustainability may indeed provide a theoretical base for urban development. Sustainable urban development will be discussed and considered as an emerging theory for urban development. In addition, this article will explore sustainable development as an overarching theoretical strategy and urban policy framework for addressing urban problems. The underlying causes and effects will be considered. Specific

policies for sustainable urban development will be discussed. An alternative that dovetails with urban sustainability might include a scheme in which energy conservation techniques, alternative energy, and improved energy efficiency fill a significant role. Recent North American and European examples of sustainability in planning and urban development are offered to demonstrate applications of the theory. The author will conclude that sustainable development is a viable approach to addressing urban concerns. Improved energy efficiency is suggested as a viable concept for implementing sustainability with unique benefits for urban areas.

BACKGROUND

The theory of sustainable development has generated significant attention within the planning community. Aspects of the theory of sustainable development have implications for planners and design professionals. For example, is impacting urban environmental pollution a relevant end for planners, engineers, and architects? By what means ought it be achieved? What physical examples of sustainable development exist? Is non-sustainable development actually inefficient? Berke finds interest in the current debate concerning the "role of sustainable development as an overarching guide to planning that is taking place at the international, national, and local government levels around the world" (Berke 2002:22).

In the new age of globalization, unifying theories can be powerful. Is sustainable development actually a new guiding vision and planning model? Berke believes sustainability is the next planning paradigm, or perhaps the "framework to dramatically shift the practice of local participation from dominance by narrow special interests toward a more holistic and inclusive view" (Berke 2002:23).

Aspects of the theory of sustainability include urban sustainability, urban development, population, environmental impacts, and energy concerns. The purpose of this article is to explore the concepts of urban sustainability and sustainable development, and their impact. This article considers the various definitions of sustainable development, explains its origins, and explores the view that urban sustainability might form a new vision for future urban development. Examples of how the concept of sustainability pertains to present practice are used to assess

the theory's application. Incorporating alternative energy technologies is critical to the success of urban sustainability.

ORIGIN OF THE THEORY

Meyerson's rational-comprehensive model for planning suggested that as "planning is designing a course of action to achieve ends, 'efficient' planning is that which under given conditions leads to the maximization of the attainment of relevant ends" (Meyerson 1955:314). As Berke observed, "Up to the 1960s, planning had a long and commendable history of visionary ideas for guiding the development of towns, cities and regions" (Berke 2002:22).

In the 1980s and 1990s, the search for a new vision led to two evolutionary approaches, one being the new urbanism and the other being sustainable development. Both approaches attempted to address concerns about equity and the conservation of environmental resources. The new urbanism attempts to recapture the urban sense for locale and community by physically reorganizing neighborhoods, reinstating the primacy of public life, improving pedestrian access, revising transportation patterns, and reintroducing mixed use development (Katz 1994). From the view of the architect, engineer, or developer, specific design principles are identified for urban regional areas, districts, neighborhoods, and streets.[1] The focus tends to be on providing alternatives to suburban sprawl and mitigating its effects.

The theory of sustainable development has a broader vision and addresses a larger range of concerns. Its framework allows for a theoretical structure referred to by Berke as "an overarching guide to planning" (Berke 2002:22). Published in 1987, the report of the World Commission on Environment and Development brought the term "sustainable development' into the world forum (Holland et al. 2000:10). This report was afterwards referred to as the "Brundtland Report." The report defined sustainable development as "development that meets needs of the present without compromising the ability of future generations to meet their needs" (Holland et al. 2000:10). The concept of generational equity was of clear concern.

As the stage was being set for the 1992 United Nations Conference on Environment and Development, Gro Harlem Brundtland, then Prime Minister of Norway, asserted that "we should not be surprised that

developing nations are approaching the Rio Summit with open economic demands. For them, it is essentially a conference about development and justice" (Panjabi 1997:282). On the other hand, there was a sense among the developed nations that they might be called upon to bear the primary financial burden of protecting the earth's biodiversity (Panjabi 1997:282). Given the lack of financial resources in the third world, such concerns were not unfounded.

AGENDA 21

The United Nations 1992 Conference on Environment and Development has been referred to as the Rio Summit, or simply the Earth Summit. Representatives from 167 nations, including the United States, attended the Rio Summit (Panjabi 1997:11). A product of the conference was the Rio Declaration on Environment and Development, referred to as Agenda 21.

Agenda 21 provides 27 guiding principles. A central rationale noted in the preamble is the desire to work "towards international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system" (United Nations 1999:1). The Agenda 21 charter deals specifically with development polices in Principles 4 and 8. Principle 8 suggests that "States should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies" (United Nations 1999:2).

Environmental protection policies are addressed in Principles 2, 4, 7, 11, 15, 16, 24 and 25 of Agenda 21. Chief among these is Principle 4, which asserts "to achieve sustainable development, environmental protection shall constitute an integral part of the development process" (United Nations 1999:2). The idea of polluters paying for the costs of pollution is introduced in Principle 16. This concept is disturbing to several countries that contribute significantly to global pollution. The charter advocates international cooperation among the states (Principles 7, 14 and 27). A significant balance of the document concerns the mechanics of how to implement and promote sustainable development.

While energy usage in its many forms is a primary contributor to global pollution (Roosa 2002:5), the term "energy" is not specifically mentioned in Agenda 21. However, the term "resource" is used categori-

cally. Principle 7 encourages "a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem" (United Nations 1999:2). Sustainable development values nature as an ethical issue and as a principle concept from which to evolve global solutions for urban sustainability, urban development, population, environmental impacts, and energy concerns.

URBAN SUSTAINABILITY

Urban sustainability is a phrase that entails a variety of meanings. Urban sustainability refers to a somewhat idealized model of urban development while attempting to address a wide set of concerns about urban growth, patterns of urban development, and issues that arise as urban development occurs. According to Beatley (2000:17), the four principles of urban sustainability in the European Community's (EC), Sustainable Cities Agenda include:

- *The principle of urban management*—a process that requires planning and impacts the governing of urban areas. The process of sustainable urban management requires tools that address environmental, social, and economic concerns.

- *The principle of policy integration*—implements the means to stimulate the synergetic effects of social, environmental, and economic dimensions of sustainability.

- *The principle of ecosystems thinking*—emphasizes the city as a complex system incorporating aspects such as energy, natural resources, and waste production

- *The principle of cooperation and partnership*—considers the crucial import of interactions among various levels of government, organizations, and interest groups.

Beatley cites European Union (EU) documents that advocate integrated approaches and argue for an ecosystems view of cities. He notes that cities affect their local environments (e.g. regional hydrologic systems) while existing simultaneously as habitats for plants and animals (Beatley 2000:16). The EU suggests that cities must be viewed as com-

plex, interconnected, and dynamic systems. "Cities are both a threat to the natural environment and an important resource in their own right. The challenge of urban sustainability is to solve both the problems experienced within the cities themselves… and the problems caused by cities" (European Commission 1996:6-7).

Drakakis-Smith suggests that "sustainability also emphasizes the interlinked nature of the individual components of rapid urbanization" (Drakakis-Smith 2000:8). The components of urban sustainability include: 1) equity, social justice, and human rights; 2) basic human needs, such as shelter and health care; 3) social and ethnic self-determination; 4) environmental awareness and integrity; 5) awareness of linkages across both space and time; and 6) not seeking gain at the expense of someone elsewhere in the world or of future generations (Drakakis-Smith 2000:8).

Berke provides another view. He studied how the dimensions of sustainable development with their links to global issues and balance have been used to guide comprehensive plans (Berke and Manta-Conroy 2000:21-33). Berke and Manta-Conroy defined sustainable development as "a process in which communities anticipate and accommodate the needs of current and future generations in ways that reproduce and balance local social, economic, and ecological systems, and link local actions to global concerns" (Berke 2000:33; Berke and Manta-Conroy 2000:23). Berke further provides six conceptual principles of sustainable development: 1) harmony with nature; 2) creating livable built environment; 3) place-based economy; 4) social equity; 5) polluters paying the costs of environmental impacts; and 6) responsible regionalism (Berke 2000:33; Berke and Manta-Conroy 2000:23).

It is apparent that the issue of urban sustainability has evolved into a broad range of variously defined yet clearly related applications. For the purposes of this article, sustainable development is defined as: The ability of physical urban development and urban environmental impacts to sustain long-term inhabitation by human and other indigenous species while providing: 1) an opportunity for environmentally safe, ecologically appropriate physical development; 2) efficient use of natural resources; 3) a framework which allows improvement of the human condition and equal opportunity for current and future generations; and 4) manageable urban growth. Non-sustainable urban development is the antithesis of sustainable urban development. Non-sustainable development implies growth that is environmentally unsafe, consumes re-

sources inefficiently, degrades the human condition, is characterized by persistently unmanageable development, and fails to value social equity.

SUSTAINABLE URBAN DEVELOPMENT

Couch notes that Agenda 21 is the primary plan for sustainable development for the 21st century. He suggested that " much of the plan requires action at the local level and all local governments are therefore expected to produce a Local Agenda 21 (LA21)" plans (Couch et al. 2000:141). The hope is that LA21 plans will address the principles of Agenda 21, while developing improved community interaction and achieving a greater degree of equity.

Implementing LA21 plans at the local level is often counter to existing planning regulations. According to Duany, "as long as the conventions of real estate development effectively outlaw the construction of mixed-use neighborhoods, developers will find it very difficult to build anything with a sense of community" (Duany et al. 2000:100). Or as Kunstler suggests, "Today we have achieved the goal of total separation of uses in the manmade landscape. The houses are all in their respective income pods, shopping is miles away from houses and the schools are separate from both the shopping and the dwellings" (Kunstler 1994:118). Such obstacles often inhibit Agenda 21 planning initiatives and create challenges for implementation of urban sustainability agendas.

The components of urban sprawl have been variously identified. One view mentions five primary parts: housing subdivisions, shopping centers, office parks, civic institutions, and roadways (Duany et al. 2000:6). An example of a contributor to sprawl is that developers are required to design their sites based on the access requirements of the oversized fire truck, thus requiring large turning radiuses. While based on safety requirements, there is irony in the fact that it is urban traffic that is a far greater threat to life safety (Duany et al. 2000:67).

Urban growth increases demand for resources. Growth usually means enlarging the urban service areas. Areas experiencing significant growth will often support creative alternatives such as the adaptive reuse of existing structures. Vast areas are needed for employee and customer parking. New buildings, transportation systems, and distribution systems are required to meet these growing demands. As new facilities

are constructed to meet urban requirements, energy usage must be considered in the planning process. This type of infrastructure planning is usually performed by the utilities, often resulting in higher costs for ratepayers and urban development authorities.

On the other hand, inner cities experiencing population losses tend to focus on "urban renewal," at times eliminating structures of historic significance in the name of reducing urban blight. While there tends to be a lack of funds to support restoration, revitalization, and infill development in areas where infrastructure is already in place, funds for new suburban infrastructure seem readily available. This bias for providing new construction and eliminating older structures is particularly evident in North American cities. The bias often manifests itself in restrictive planning laws, exclusive zoning, selective districting enforcement, and uneven tax assessment policies.

What other forces cause us to consume land as our cities growth? To create larger facilities, manufacturing tends to move to the urban perimeter where land is less costly. Roads are constructed. "Leapfrog" development requires the costly extension of utility infrastructure. People then migrate to locations where employment is available. Shopping areas are constructed nearer to where the people live. This cycle creates greater demands on land use. Cities, albeit due to both in-migration and mergers, began occupying more space after World War II. North American examples include: 1) Oklahoma City – increased from 130 to 1,632 square kilometers in area from 1950 to 1970; 2) Tulsa—increased from 70 to 445 square kilometers in area from 1950 to 1970; 3) Atlanta—increased from 96 to 342 square kilometers in area from 1950 to 1970; 4) Kansas City—increased from 220 to 818 square kilometers in area from 1950 to 1960 (Stephens and Wilkstrom 2000:46).

Why must cities consume such large areas of real estate? Sustainable development advocates often suggest reducing (as opposed to enlarging) the urban "footprint." Techniques such as using improved infrastructure technologies and more creative design approaches provide logical alternatives. Urban expansion significantly impacts world energy consumption as it requires more energy to provide critical urban services.

POPULATION GROWTH

The expansion of urban populations has long been recognized and the evidence is incontrovertible. Rapid population growth on a global

scale has increasingly placed a growing burden on our planet's resources. The paradox is that while many metropolitan areas have become wealthier, they contain increasing numbers of the poor (Savitch and Kantor 2002:17).

Over half of the world's population now lives in urban areas, gaining over one billion in population in only the last 30 years. The World Bank noted that in 1990, the world urban population had grown to equal non-urban settlements and that urban populations were growing at a rate of 4.5 percent per year (Drakakis-Smith 2000:8). Is population growth of this magnitude sustainable? Are we planning for urban growth on this scale?

By 1970 in the U.S., more people lived in the suburbs than in either urban or rural areas (DiGaetano and Klemanski 1999:45). As Stephens and Wikstom noted, "99 percent of the 153 million increase in (U.S.) population between 1930 and the estimate for year 2000 has occurred in the nation's metropolitan areas" (Stephens and Wilson 2000:16).

Consider the urban growth of Las Vegas, Nevada, a city that by some measures has the fastest growth rates in the U.S. Despite being born as a center for tourism and gambling, the city has spawned significant industrial and commercial development. Census data indicate that the area population increased from 273,000 to 863,000 from 1972 to 1992. The year 2000 census lists the Las Vegas metropolitan area population at 1,376,000.[2] North American examples are dwarfed by the growth of many cities in the third world (e.g. Calcutta, Mexico City, Sao Paolo, Shenzhen).

ENVIRONMENTAL IMPACT

There are negative externalities that apply to urban environmental pollution which are worthy of consideration. Sustainable development deals with the environmental impact of development. According to the United Nations Commission on Sustainable Development, "air and water pollution in urban areas are associated with excess morbidity and mortality… Environmental pollution as a result of energy production, transportation, industry or life-style choices adversely affects health. This would include such factors as ambient and indoor air pollution, water pollution, inadequate waste management, noise, pesticides and radiation" (UN 2001:38). The report also notes that 1.1 billion people

lack access to clean water, while 2.5 billion people lack adequate sanitation (UN 2001:38).

More efficient use of energy in the built environment can have a significant impact in meeting certain urban goals. These goals include more appropriate housing solutions, improving transportation systems, and reducing environmental impact. Energy usage is a major contributor to environmental pollution. Resource conservation provides the opportunity to accommodate urban expansion without constructing additional power generating facilities while mitigating environmental impact. Power plants and vehicles account for a significant portion of sulfur oxides, carbon,[3] and nitrogen emissions into the atmosphere.

International efforts at mitigation of environmental impacts include the Kyoto Protocol. While the 15 members of the European Union (a total of 87 countries worldwide) have ratified the Kyoto Protocol, the U.S. has resisted, saying that implementation would cost the country up to $400 billion and 4.9 million jobs (*Louisville Courier Journal* 2002:A4). However, the analysis failed to consider the employment that would have been created by efforts to comply, excluding employment in the fields of alternative energy and energy conservation.

ENERGY CONCERNS

Perhac noted that the use of energy has impacted the urban experience. The availability of an inexpensive supply of energy has often facilitated urban development and growth. Taking a long-term view, energy usage has increased significantly, from about 300 lbs. of equivalent annual usage of coal per person in 1860 to more than 4,000 lbs. in 1984 (Perhac 1989:41-44).

Energy usage is increasing worldwide. The U.S., as the world's largest energy consumer, provides an interesting example. From 1970 to 1996, total energy consumption in the United States grew from 67.9 quadrillion Btus to 93.9 quadrillion Btus. Energy from renewable sources grew from 2.7 quadrillion Btus, or 4 percent of the total to 7.2 quadrillion Btus, 7.7 percent of the total. In 1999, total U.S. energy usage was 96.6 quadrillion Btus, with transportation fuels using 25.9 quadrillion Btus or 26.8 percent of the total (U.S. Census Bureau 2000:583).

The issue of urban energy consumption has global implications. Interestingly, energy usage is highly decentralized while energy genera-

tion and production tend to be relatively centralized. Energy usage has an identified set of benefits and costs. Externalities include not only those associated with water and air pollution, but also economic availability and equity issues. Energy usage in the built environment has been increasing due to a number of causes. Rapid increases in population and increases in conditioned space are contributing causes of increasing energy use. The need for highly conditioned space has developed into new standards for human comfort, especially in the workplace. More efficient use of energy in the built environment can have a significant impact on reducing direct economic costs. These cost reductions include the ability to provide for urban expansion without constructing additional power generating facilities. Costs required to mitigate environmental impacts is yet another example. While technologies are available to provide more efficient use of energy, economically viable technologies are often not implemented.[4]

Power production and power use have both urban and regional impact. Where will the next power plant be constructed? Will the strip mine be allowed? Will another oil tank farm be allowed next to the river where port facilities are available? How much longer will the nuclear power plant be allowed to operate? How large a commercial zone can be developed given the energy supply available? Is a new gas pipeline through the city really necessary? How can the coal plants be modified to be less polluting? Is mountain-top removal really necessary to satisfy the increasing demands for coal? Will we open more lands to oil drilling? The list seems endless.

From a technological capability standpoint, we have the flexibility to select from multiple energy sources to satisfy a given requirement, allowing the most appropriate energy source to be used. Also, we now have improved technologies with which we can design and build facilities that are extremely efficient. Are we doing that? Flemming and Goodman suggest that the U.S. is experiencing an energy crisis that we must learn to live with. Many of our buildings waste energy needlessly and incorporate few conservation or reclamation features (Meckler 1994:41).

It is an interesting paradox that despite improved design standards, many newer buildings use significantly more energy than older ones. This is due to their design, location, the construction technologies employed, and equipment utilized. Causes for the increases include the changing standards for fresh air admission into occupied space. Increasing ventilation air means that greater energy costs are incurred in pro-

ducing occupancy air (cooled or heated, humidified or dehumidified) from unconditioned air. Consider the new "high tech" companies that are highly prized by cities competing to attract service industries. Sioshansi notes that the demand for energy appears to be surging in the service and high technology sectors but has not fallen off appreciably in other sectors. High technology companies such as Cisco Systems, Oracle, Sun Microsystems, HP, and Intel happen to be major consumers of electricity. Oracle's complex in Silicon Valley uses an estimated 13 MW, while Sun's campus over 26 MW (Sioshansi 2001:64-70).

DOING NOTHING

The concerns which sustainable development attempts to address suggest that to do nothing may not be the wisest approach. Historical trends indicate that our cities will continue to grow.

As they grow, they will require multiple and dependable supplies of energy, both renewable and non-renewable, to ensure that growth is sustained. Doing nothing effectively defaults to the continuation of current approaches. This exacerbates existing problems and sets into motion a series of events that not only supports the status quo but also causes new approaches and technologies to be stymied. Despite economic advantages, once infrastructure is in place, doing nothing often seems the most expedient alternative. It may also result in less immediate work for a decision maker. Meanwhile, reductions in employment occur in economic sectors that provide renewable energy production, energy conservation, energy efficiency services, and alternative design and planning approaches. A wide range of solutions needs to be employed to solve the complex problems associated with increased energy usage due to urban growth. The approaches selected must be both supply (production) and demand (consumer usage) oriented.

Al-Homound (2000:21-38) believes that "Usable resources are made available to mankind to be utilized for their benefit and well-being. Every individual bears the responsibility of not wasting or misusing usable resources. All moral codes are against such actions. Therefore, every individual should be educated and trained to become part of the management of resources for the benefit of generations to come." Having a moral belief that resource efficiency is beneficial certainly has global social implications.

EXAMPLES OF SUSTAINABLE DEVELOPMENT

In September 2002, the World Summit on Sustainable Development was held in Johannesburg, South Africa. At the conference, U.S. Undersecretary of State Paula Dobriansky stated that, "The United States is the world's leader in sustainable development. No other nation has made a greater and more concrete commitment" (Verrengia 2002b:A17). Despite such rhetoric, it seems difficult to find many broadly based examples of sustainable development initiatives in the U.S. There is evidence that planners are incorporating aspects of the language of sustainable development into their comprehensive plans. One regional example is the establishment of the Florida Sustainable Communities Network.

The U.S. Department of Energy freely admits on its Energy Efficiency and Renewable Energy Network (which it co-sponsors) that "the complex problems shared by cities throughout the U.S. are evidence of the impacts of urban sprawl—increasing traffic congestion and commute times, air pollution, inefficient energy consumption and greater reliance on foreign oil, loss of open space and habitat, inequitable distribution of economic resources, and the loss of a sense of community."[5] While a few interesting local and regional examples exist in the U.S., achieving sustainable development is not a legislated goal of the U.S. government.

Most U.S. success stories tend to focus on water and sewer improvements, non-urban land conservation, sprawl mitigation, farmland preservation, preservation of open space, and public transportation initiatives (e.g. Civano Sustainable Community Project, Lake Tahoe Regional Plan, the Grand Rapids, Michigan Plan, Manchester VT Planning and Zoning Program, Ashfield MA, Chattanooga TN). Santa Monica, California, not only adopted a Sustainable City Program but also mandated in 1999 that 100 percent of its energy must come from renewable sources (Beatley 2000:361). Development alternatives such as the new urbanism has yielded the communities of Seaside, Florida, and Laguna West, California, offering fresh examples of successful higher density, mixed-use development. Arcosanti, Arizona, is a rare North American example of an ecologically based experimental community dedicated to alternative energy, concentrated development, and a reduced role for the automobile.

Interestingly, stronger examples of sustainable development are easier to find elsewhere in the world. A proponent of the planning con-

cept of an "ecological city" has been Kishio Kurokawa. His "eco-media city" is a more "developed version of the eco-city" (Kurokawa 1998:2). He proposed a Futian, China, city center plan based on an eco-media city park concept for the information age to symbolize urban sustainability (Cartier 2002:1521).

The June 1997 Treaty of Maastricht incorporates sustainable development as a specific objective for European nations. Additionally, sustainability schemes have been prepared by most European nations and many European cities (Beatley 2000:15). These programs have provided incentives for wind farms in Austria, caused German automotive manufactures to develop new ways to recycle vehicle components, and led to improved energy resource management.

European examples of sustainable planning and development abound. The town of Navarra, Spain, has the ambitious goal of providing 100 percent of all electrical energy by renewable energy sources by 2010 (AEE Hungarian Chapter 2001:263). The Building Act in Finland "establishes sustainable development as the foundation for land use planning" (Beatley 2000:20). Almost a third of the locales in Finland are developing LA21 plans (Beatley 2000:348). In the UK, 73 percent of local communities are in the process of developing LA21 plans (Beatley 2000:347). Cities in Sweden have almost 100 percent participation in their LA21 planning initiative. In the Linz suburb of Pichling, a new solar powered district for 25,000 is under construction (Beatley 2000:275). In the United Kingdom, Leicester, Leeds, Middlesborough, and Peterborough are among those that have achieved the "Environmental City" designation as a result of their planning efforts. Ecolonia in The Netherlands, a demonstration town for ecological development, provides yet another example.

OPPOSING VIEWS

The concept of sustainable development is relatively new. Physical developments exemplifying its principles have not endured extensive evaluation over an extended period of time. In addition, planners may tend to choose approaches to which they are most accustomed. Often, local codes and ordinances may preclude or even penalize installation of sustainable technologies. With all these complications, are the conceptual goals of urban sustainability valid from a practical perspective?

Some believe that sustainable development is not a goal worth pursuing. Holland summarizes their views by stating that the concept is "incapable of uniting the hopes of those who fight for justice, those with concerns for the future and those who want to defend nature, but also that it has the potential both to frustrate and to marginalize these very causes" (Holland et al. 2000:2).

Another argument against implementing sustainable or alternative technologies is that investments fail the "simple payback test" or some other imposed economic standard. What this implies is that investors will need a given guaranteed rate of return to implement new technologies. These critics fail to mention that most of the conventional technologies currently being used typically fail the same criteria. For example, atomic energy research is heavily subsidized in the U.S., and almost 90 percent of the U.S. Department of Energy budget has been diverted to atomic energy research and security purposes. When the costs of externalities are factored into the equation (which seldom occurs), less sustainable technologies fail miserably. The status quo is maintained primarily due to the fact that the infrastructure supporting it is already in place.

Peter Gordon and Harry Richardson level a set of arguments not against sustainable development but against its core beliefs. They suggest that: 1) there is a global energy glut and that markets "are the real sources of energy" shortages; 2) their evaluation "does not support the case for compact cities"; and 3) that the movement to the suburbs "has been the dominate and successful mechanism for reducing congestion" (Gordon and Richardson 1997:95-107). The issues surrounding present-day energy scarcity in third world countries is covertly overlooked. In addition, they imply that a market-driven energy shortage is required before increased efficiency would be considered viable. In the same paper they do admit that "the absence of congestion pricing and emissions fees is a widely acknowledged problem; it constitutes an implicit subsidy to auto users" (Gordon and Richardson 1997:97). If the movement to the suburbs has been such a successful mechanism for reducing congestion, then why is it that congestion pricing and emissions fees are considered problematic?

Recently, political opposition to sustainable development policies was brought to bear by the U.S. central government. Part of the action plan of the World Summit on Sustainable Development included the use of renewable energy technologies to be increased to 15 percent of world-

wide energy production by 2010 (Verrengia 2002a:A4). Delegates from the United States, Saudi Arabia, and other states "were lobbying to eliminate the provision and set no specific goals" (Verrengia 2002a:A4). The fact that the alliance was led by the world's largest oil consumer and the world's largest oil exporter was not lost on the international delegates. It is regrettable that the U.S. delegation failed to proffer more viable alternatives. The U.S. counter-proposal included a series of relatively ambiguous industry and foundation partnerships involving (at most) only $600 million per year over four years. This figure is dwarfed by the hundreds of billions of dollars expended annually by the U.S. on foreign oil and even more by the $703 billion expended on all energy during the year 2000.

CONCLUSION

From the literature, it is clear that the concept of sustainability has a variety of definitions and applications. This discussion has provided a selected (but not all-inclusive) range of definitions of sustainable development. An alternative definition, restating the principles of the theory, was also provided. Aspects of the approaches to urban sustainability, urban development, population, environmental impacts, and energy concerns were individually discussed.

The idea of doing nothing and maintaining the status quo was also considered. Empirical examples demonstrating efforts to implements aspects of sustainability in planning and development were offered.

While there are numerous European Union examples of efforts to implement sustainable development agendas, U.S. examples are more difficult to find. Regardless, empirical examples suggest that the concept of sustainable development is being incorporated into global, urban, and local planning guidelines. While there are critics of the ideals of sustainable development, the concepts are clearly gaining popularity. However, sustainable development has not yet developed into a mainstream theory. Nevertheless, it certainly provides a theoretical basis and framework for future planning and development while providing a possible "over-arching" vision. The concept has also succeeded in providing a multidisciplinary basis for integrating solutions that may have significant future impact on global development, energy use, and environmental issues.

From the evidence, it is clear that sustainable development is a newly evolving planning theory that has entered the world debate since the 1980s. The theory has found its way into the literature and is being used in many locales in planning schemes and agendas. Sustainability is proving a viable concept for dealing with urban problems. Incorporating alternative energy solutions into development efforts supports this agenda and can significantly contribute to urban sustainability.

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Footnotes

1. For the principles of the *Charter of New Urbanism* see Berke 2002:27-28.
2. Other U.S, examples of significant population growth from 1990 to 2000 include: Naples FL, +65.3%; Yuma AZ +49.7%; Austin TX, 47.7%; Boise ID, +46.1%; Phoenix AZ, +45.3%; and Laredo TX +44.9%. Source: U.S. Census Bureau, Census 2000 and Census 1990. See www.census.gov.
3. As an example, carbon emissions are expected to continue grow in the U.S. by 9 to 13 per cent over the next 10 years. See *Louisville Courier Journal* 2002:A4.
4. See Roosa, Stephen A. (2002). A Discussion of the Economic Aspects of Implementing Energy Conservation Opportunities. *Strategies for Energy and Facility Management Challenges*. Atlanta: Association of Energy Engineers.
5. See U.S. Department of Energy (22 May 2002) http://www.sustainable.doe.gov/landuse/luintro.shtml.

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